Name: _____ Period: _____ Date: _____

Genetics: Problem Set 1: Monohybrid Crosses

Instructions: in the problems below, use a Punnett square to predict the outcome. Please show both the phenotype and genotype ratio.
FOR CREDIT, USE and SHOW THE FOLLOWING SIX STEPS: 1) write the genotypes of the parents. 2) Draw a Punnett square. 3) Put the possible alleles of the gametes on the top and side of the square. 4) Bring the alleles of possible gametes together. 5) Show the genotype ratio. 6) Show the phenotype ratio.

1. In peas, the gene for tall (T) is dominant to the gene for short (t). What will happen if a plant that is homozygous tall is crossed with a plant that is heterozygous tall?	Genotype ratio: Phenotype ratio:
2. In carnations, the gene for red flowers (R) is dominant to the gene for white flowers (r). What will happen if a plant homozygous for red flowers is crossed with a plant homozygous for white flowers?	Genotype ratio: Phenotype ratio:
3. In mice, the gene for a black coat (B) is dominant to the gene for a white coat (b). What will happen if a mouse that is heterozygous black is crossed with a mouse that is homozygous white?	Genotype ratio: Phenotype ratio:
4. Why does an organism that shows a recessive phenotype have to be homozygous? (No punnett square needed: put an explanation in the space to the right)	
5. Reread the information on carnations in question 2. What will happen if two plants that are heterozygous red are crossed with one another? (more on the opposite side)	Genotype ratio: Phenotype ratio:

6. In humans, the genetic disease sickle cell anemia is caused by a recessive allele (s). The normal allele (S) codes for normal hemoglobin, the oxygen carrying protein in red blood cells. A man with sickle cell disease has children with a woman who is heterozygous normal. What is the probability that their children will inherit the disease? What is the probability that their children will be carriers?	Genotype ratio: Phenotype ratio:
7. Once more, we return to carnations (see question 2). Say that you have a red carnation plant. You don't know if it's homozygous or heterozygous. How could you figure this out? Demonstrate your answer by setting up a Punnett square.	Genotype ratio: Phenotype ratio:
8. In summer squash, white fruit color is dominant. Yellow is recessive. A squash plant that is homozygous for white is crossed with a homozygous yellow one. Predict the genotypes and appearance the offspring.	Genotype ratio: Phenotype ratio:
9. Use the information above. If two of the offspring of the cross above are mated, what will be the genotypes and phenotypes of the offspring?	Genotype ratio: Phenotype ratio:

Genetics: Problem Set 2: Blood Type/Codominance/Multiple alleles

BLOOD TYPE QUESTIONS and PROBLEMS: SHOW WORK and have COMPLETE ANSWERS FOR CREDIT. Whenever possible, follow ALL SIX steps for solving genetics problems. Answers are provided on the last section, so keep on working until you can independently get each problem right!

1. Explain why type O blood is sometimes referred to as the universal donor	
2. Why is a person with type AB blood considered a universal recipient?	
3. What are the possible genotypes that could produce blood type A?	
4. The mother has the genotype Ao. The father has blood type AB. What will be the genotypes and phenotypes of their offspring.	

5. One parent has type A blood and the other parent has type B blood. What are the parents' genotypes if they produce a large number of children whose blood types are:

a) all AB	b) 1/2 AB and 1/2 B
c) 1/2 AB and 1/2 A	d) 1/4 AB, 1/4 B, 1/4 A, and 1/4 O

6. Three brothers have blood types A, B, and O. What are the chances that the parents of these three will have a fourth child whose blood type is AB?	

7. A man with blood type AB marries a woman with blood type O. Is it possible for them to have children with the same blood type as either of the parents? Use a Punnett square to explain your answer.	
8. An abandoned baby was picked up by the police. Later two different women claimed to be the mother. Blood studies revealed that woman 1 was type A. Woman 2 was type AB. The baby was type O. Which woman was possibly the mother? Explain.	
9. What are the possible blood types of children in the following families? NOTE: ALL OF THESE PROBLEMS REQUIRE AT LEAST ONE PUNNET SQUARE, USUALLY MORE!	
9a. Type A mother, type A father	
9b. Type A mother, type O father	
9c. Type B mother, type AB father	

Genetics: Problem Set 3: Sex Linked Genes

Sex linkage Practice Problems: Follow all 6 steps for solving genetics problems!. Note that solutions are provided at the back of this packet. Try the problem, and then check your work. If you didn't get it the first time, do it again.

1. In fruit flies, determine the probable genotypic and phenotypic ratios expected from a cross between a heterozygous female and red-eyed male, Use W to represent red eyes, and w to represent white. Don't forget that these are on the X chromosome.	
2. In fruit flies, a heterozygous female and a white-eyed male mate. What are the genotypes and phenotypes of the offspring.	
3. In fruit flies, a red-eyed male and a white-eyed female mate. What are the genotypes and phenotypes of the offspring.?	
4. A man with hemophilia (a recessive sex-linked condition, symbolized by the letter "h") has a normal daughter. She marries a man who is normal. What is the probability that one of their daughters will be a hemophiliac? What is the probability that a son will be a hemophiliac?	

5. A woman whose father was a hemophiliac, but who is not herself a hemophiliac marries a man who is normal. a. What is the chance of hemophilia in her sons? b. In her daughters?	
6. A woman and a man, both with normal blood clotting, have a normal son, a hemophiliac son, and two normal daughters. What is the probable genotype of each family member?	
7. Colorblindness is a sex-linked recessive condition. A color blind man marries a woman with normal vision whose father was color blind. What is the probability that one of their daughters is colorblind? What is the probability that one of their sons is colorblind?	
8. A colorblind man mates with a normal-vision woman and produces a colorblind son and a normal vision daughter. What are the genotypes for each of these four individuals?	
9. Two normal vision parents produce a color-blind son. What are the genotypes of the parents? What are the chances of their next child being a colorblind daughter?	
10. In humans, Duchenne's muscular dystrophy is a condition in which the muscles waste away ending with death in the very early teenage years. It is caused by a sex-linked recessive gene. The condition is found in boys, not girls. Why is it not expected in girls?	

Genetics: Problem set 4: Dihybrid Crosses

1. *In peas, round seeds (R) dominates over wrinkled seeds (r). Yellow seed color (Y) dominates over green (y).*What is the genotype of an organism that is homozygous round and heterozygous yellow? What gametes could this organism form?	Parents geneotype: _____ Possible gametes: _____
2. Same set-up as problem # 1: What is the genotype of an organism that is heterozygous round and homozygous green? What gametes could it form?	Parents geneotype: _____ Possible gametes: _____
3. Refer again to problem # 1: What is the genotype of an organism whose genotype is homozygous wrinkled and homozygous yellow? What would be the possible genotypes of its gametes?	Parents geneotype: _____ Possible gametes: _____
4. Refer again to problem # 1: Cross a homozygous round, heterozygous yellow plant with one that is heterozygous round and homozygous green. What are the phenotypes of the offspring?	
5. In watermelon, green (G) is dominant to striped (g). Short (S) is dominant to long (s). What is the genotype of an organism that is heterozygous green and heterozygous short? What gametes can it form?	Parents geneotype: _____ Possible gametes: _____

6. In watermelon, green (G) is dominant to striped (g). Short (S) is dominant to long (s). Cross two individuals who are both heterozygous green and short. What are the phenotypes of the offspring?	
7. In humans, the gene for normal skin color (A) dominates the gene for albino skin (a). The gene for normal body height (M) dominates the gene for being a dwarf (m). Cross one parent that is heterozygous normal skin and heterozygous normal height with a heterozygous normal skin dwarf. What are the resulting phenotypes in the offspring?	
8. Refer to the problem above. Cross a homozygous normal skinned dwarf with an albino dwarf. What are the resulting phenotypes?	

Punnett Square Practice 1: Solutions

1. In peas, the gene for tall (T) is dominant to the gene for short (t). What will happen if a plant that is homozygous tall is crossed with a plant that is heterozygous tall?

Step 1. Parents: TT x Tt
Step 3.

	T	T
T		
t		

Step 4.

	T	T
T	TT	TT
t	Tt	Tt

Step 5: a) Genotype ratio:50% TT, 50% Tt
b) Phenotype ratio: 100% tall.

2. In carnations, the gene for red flowers (R) is dominant to the gene for white flowers (r). What will happen if a plant homozygous for red flowers is crossed with a plant homozygous for white flowers?
Step 1. Parents: RR x rr
Step 3.

	R	R
R		
R		

Step 4.

	R	R
r	Rr	Rr
r	Rr	Rr

Step 5: a) Genotype ratio: 100% Rr
b) Phenotype ratio: 100% red

3. In mice, the gene for a black coat (B) is dominant to the gene for a white coat (b). What will happen if a mouse that is heterozygous black is crossed with a mouse that is homozygous white?
Step 1. Parents: Bb x bb
Step 3.

	B	b
b		
b		

Step 4.

	B	b
b	Bb	bb
b	Bb	bb

Step 5: a) Genotype ratio: 50% Bb, 50% bb
b) Phenotype ratio: 50 % black, 50% white

4. Why does an organism that shows a recessive phenotype have to be homozygous? (No punnett square needed: put an explanation in the space to the right)

ANSWER: The only way that you can express a recessive phenotype is if you don't have a dominant allele. If you have the dominant allele, that allele will show up in your phenotype. Therefore, if you have the dominant allele, you HAVE to be homozygous recessive.

5. Reread the information on carnations in question 2. What will happen if two plants that are heterozygous red are crossed with one another?

Step 1. Parents: Rr x Rr
Step 3.

	R	r
R		
r		

Step 4.

	R	r
R	RR	Rr
r	Rr	Rr

Step 5: a) Genotype ratio: 25%RR, 50%Rr, 25% rr.
b) Phenotype ratio: 75% red, 25%white

6. In humans, the genetic disease sickle cell anemia is caused by a recessive allele (s). The normal allele (S) codes for normal hemoglobin, the oxygen carrying protein in red blood cells. A man with sickle cell disease has children with a woman who is heterozygous normal. What is the probability that their children will inherit the disease? What is the probability that their children will be carriers?

Step 1. Parents: ss x Ss
Step 3.

	s	s
S		
s		

Step 4.

	s	s
S	**Ss**	**Ss**
s	**ss**	**ss**

Step 5: a) Genotype ratio: 50% Ss, 50% ss
b) Phenotype ratio: 50% chance of sickle cell, 50% normal (but carriers of the recessive allele)

7. Once more, we return to carnations (see question 2). Say that you have a red carnation plant. You don't know if it's homozygous or heterozygous. How could you figure this out? Demonstrate your answer by setting up a Punnett square.

ANSWER: To see if your organism is homozygous or heterozygous, just cross your red carnation with a white carnation. This is called a **testcross**, which is "crossing an organism of unknown genotype with a recessive." Here's how this would work in our example.

First, assume your carnation is a homozygote.
Step 1. Parents: RR x rr
Step 3.

	R	R
R		
R		

Step 4.

	R	R
r	Rr	Rr
r	Rr	Rr

In this case, all the offspring are red, so you know that your plant had to be homozgous dominant.

The second possibility is that your carnation is heterozygous. If so, you'd have the following cross:

Step 1. Parents: Rr x rr
Step 3.

	R	r
R		
R		

Step 4.

	R	r
r	Rr	rr
r	Rr	rr

Half of the offspring will be white.

Conclusion: to determine the genotype of an organism with a dominant phenotype, cross it with a recessive. If you see ANY white offspring, then you know the parent had to be a heterozygote.

8. In summer squash, white fruit color is dominant. Yellow is recessive. A squash plant that is homozygous for white is crossed with a homozygous yellow one. Predict the genotypes and appearance the offspring.

Start by making up a symbol, like W for white and w for yellow.
Step 1. Parents: WW x ww
Step 3.

	W	W
w		
w		

Step 4.

	W	W
w	Ww	Ww
w	Ww	Ww

Genotype: 100% Ww
Phenotype: 100% white.

9. Use the information above. If two of the offspring of the cross above are mated, what will be the genotypes and phenotypes of the offspring?

Step 1. Parents: Ww x Ww
Step 3.

	W	w
W		
w		

Step 4.

	W	w
W	WW	Ww
w	Ww	ww

Genotype: 25% WW, 50% Ww, 25%ww
Phenotype: 75% white, 25% yellow

Problem Set 2: Blood Type Problems: Solutions

1. Explain why type O blood is sometimes referred to as the universal donor. Is this true in the case of O^+ blood?
   O negative can donate to any other blood type, making it the universal donor.
2. Why is a person with type AB blood considered a universal recipient?
   AB can receive blood from any other blood type.
3. What are the possible genotypes that could produce blood type A?
   Ao, or AA
4. What is the probable genotypic ratio among children born to a mother having the genotype Ao and a father with blood type AB?

	A	o
A	AA	Ao
B	AB	Bo

5. One parent has type A blood and the other parent has type B blood. What are their genotypes if they produce a large number of children whose blood types are: a) all AB ; b) 1/2 AB and 1/2 B, c) 1/2 AB and 1/2 A, and d) 1/4 AB, 1/4 B, 1/4 A, and 1/4 O
   A) AA and BB, b) BB and Ao, c) AA and Bo, d) Ao and Bo
6. Three brothers have blood types A, B, and O. What are the chances that the parents of these three will have a fourth child whose blood type is AB?
   The chance that their next child will be AB is ¼.

	A	o
B	AB	Bo
o	Ao	oo

7. A man with blood type AB marries a woman with blood type O. Is it possible for them to have children with the same blood type as either of the parents? Use a Punnett square to explain your answer.
   All children will be type A or B. Type O is impossible.

	A	B
o	Ao	Bo
o	Ao	Bo

8. An abandoned baby was picked up by the police. Later two different women claimed to be the mother. Blood studies revealed that woman 1 was type A. Woman 2 was type AB. The baby was type O. Which woman was possibly the mother? Explain.
   *Woman # 2 can only have children that are type A, B, or AB. With the genotype **AB**, she has to pass along the **A** or **B** allele, making type O impossible. Woman 1 is a possible mom, as long as she's a heterozygote.*
9. What are the possible blood types of children in the following families?
   a. Type A mother, type A father: *Answer: A or O*
   b. Type A mother, type O father: *Answer: A or O*
   c. Type B mother, type AB father: *Answer: A, B, AB*
   d. Type AB mother, type AB father: *Answer: A, B, AB*
   e. Type A mother, type B father: *Answer: A, B, AB, O*
10. A man with blood type B marries a woman with blood type A. Their first child has type O blood. What are the genotypes of the parents and offspring? What genotypes would you expect for any future offspring this couple might have?
    If they have any children that are type O, then they must both be heterozygotes. Each child can be any blood type.

	A	o
B	AB	Bo
o	Ao	oo

11. A woman is married for a second time. Her first husband was blood type A and her child from that marriage was blood type O. Her new husband is blood type B, her child from this second marriage is blood type AB. What is the woman's genotype and blood type? *Based on her first child, she must have the "o" allele (or she couldn't have had a type O child). From her second child, she must have an **A** allele. Her genotype must be **Ao***

Problem Set 3: Sex Linked Problems: Solutions

Sex linkage Practice Problems: Follow all steps for solving genetics problems!

1. In fruit flies, determine the probable genotypic and phenotypic ratios expected from a cross between a heterozygous female and red-eyed male,

Step 1. Parents: X^WX^w, X^WY

Step 3.

	X^W	Y
X^W		
X^w		

Step 4.

	X^W	Y
X^W	X^WX^W	X^WY
X^w	X^WX^w	X^wY

Step 5: a) Genotype ratio:25% X^WX^W, 25% X^WX^w ,25% X^WY ,25% X^wY

b) Phenotype ratio: 50% normal female, 25% normal male ,25% white eyed male

2. In fruit flies, a heterozygous female and a white-eyed male mate. What are the genotypes and phenotypes of the offspring.

Step 1. Parents: X^WX^w, X^WY

Step 3.

	X^w	Y
X^W		
X^w		

Step 4.

	X^w	Y
X^W	X^WX^w	X^WY
X^w	X^wX^w	X^wY

Step 5: a) Genotype ratio:25% X^WX^w, 25% X^wX^w ,25% X^WY ,25% X^wY

b) Phenotype ratio: 25% normal female, 25% white eyed female, 25% normal male ,25% white eyed male

3. In fruit flies, a red-eyed male and a white-eyed female mate. What are the genotypes and phenotypes of the offspring.?

Step 1. Parents: X^wX^w, X^WY

Step 3.

	X^W	Y
X^w		
X^w		

Step 4.

	X^W	Y
X^w	X^WX^w	X^wY
X^w	X^WX^w	X^wY

Step 5: a) Genotype ratio: 50% X^WX^w, 50% X^wY

b) Phenotype ratio: 50% normal female (carriers), 50% white eyed male

4. A man with hemophilia (a recessive sex-linked condition, symbolized by the letter "h") has a normal daughter. She marries a man who is normal. What is the probability that one of their daughters will be a hemophiliac? What is the probability that a son will be a hemophiliac?

Step 1. A hemophiliac man must pass his allele for hemophilia onto his daughters. That means that the daughter MUST be a heterozygote, and her husband (not a hemophiliac) must be normal: Parents: X^HX^h, X^HY

Step 3.

	X^H	Y
X^H		
X^h		

Step 4.

	X^H	Y
X^H	X^HX^H	X^HY
X^h	X^HX^h	X^hY

Step 5: a) Genotype ratio: 25% X^HX^H, 25% X^HX^h, 25% X^HY, 25% X^hY

b) Phenotype ratio: 25% normal females, 25% normal males, 25% hemophiliac males

5. A woman whose father was a hemophiliac, but who is not herself a hemophiliac marries a man who is normal.

a. What is the chance of hemophilia in her sons?

b. In her daughters?

Step 1. A hemophiliac man must pass his allele for hemophilia onto his daughters. That means that the woman MUST be a heterozygote. Her husband is not a hemophiliac, so he must be normal: Parents: X^HX^h, X^HY

Steps 3 – 5: SEE PROBLEM 4: it's the same problem

6. A woman and a man, both with normal blood clotting, have a normal son, a hemophiliac son, and two normal daughters. What is the probable genotype of each family member?

Step 1. His genotype must be X^HY. To start you don't know her genotype: she can be a heterozygote or a homozygote X^HX^-, X^HY

Step 3.

	X^H	Y
X^H		
X^-		

Step 4. Now start filling in the genotypes of the offspring. They have had a hemophiliac son, so he has to have gotten this allele from his mother.

	X^H	Y
X^H		
X^h		X^hY

Complete the rest of the square:

	X^H	Y
X^H	X^HX^H	X^HY
X^h	X^HX^h	X^hY

Step 5: a) Genotypes of the family: Each girl has a 50% chance of being X^HX^H or X^HX^h. The normal boy is X^HY, and the hemophiliac son is X^hY. The father is X^HY and the mother is X^HX^h

7. Colorblindness is a sex-linked recessive condition. A color blind man marries a woman with normal vision whose father was color blind. What is the probability that one of their daughters is

colorblind? What is the probability that one of their sons is colorblind?

Step 1. Because he's colorblind, his genotype must be X^cY. If she is the daughter of a colorblind man, then she MUST be a heterozygote. Therefore, the parental genotypes are X^CX^c, X^cY

Step 3.

	X^c	Y
X^C		
X^c		

Step 4.

	X^c	Y
X^C	X^CX^c	X^CY
X^c	X^cX^c	X^cY

Step 5: The probability that one of their sons is colorblind is 50%. The probability that one of their daughters is colorblind is also 50%.

8. A colorblind man mates with a normal-vision woman and produces a colorblind son and a normal vision daughter. What are the genotypes for each of these four individuals?

Step 1. Because he's colorblind, his genotype must be X^cY. Initially, you don't know her genotype: should could by homozygous normal or heterozygous normal. Parental genotypes: X^CX-, X^cY

Step 3.

	X^c	Y
X^C		
$X-$		

Step 4. They've had a colorblind son: that son could only have inherited that allele from his mother. So she MUST be a heterozygote.

	X^c	Y
X^C		
X^c		X^cY

Now just complete the square:

	X^c	Y
X^C	X^CX^c	X^CY
X^c	X^cX^c	X^cY

Step 5: The father is X^cY. The mother is X^CX^c . The daughter could be heterozygous or homozygous. The son must be X^cY.

9. Two normal vision parents produce a color-blind son. What are the genotypes of the parents? What are the chances of their next child being a colorblind daughter?

Step 1. Because he's not colorblind, his genotype must be X^CY. Initially, you don't know her genotype: should could by homozygous normal or heterozygous normal. Parental genotypes: X^CX-, X^CY

Step 3.

	X^C	Y
X^C		
$X-$		

Step 4. They've had a colorblind son: that son could only have inherited that allele from his mother. So she MUST be a heterozygote.

	X^C	Y
X^C		
X^c		X^cY

Now just complete the square:

	X^C	Y
X^C	X^CX^C	X^CY
X^c	X^CX^c	X^cY

Step 5: The father is X^CY. The mother is X^CX^c . There is NO chance that this couple could produce a colorblind daughter.

10. In humans, Duchenne's muscular dystrophy is a condition in which the muscles waste away ending with death in the very early teenage years. It is caused by a sex-linked recessive gene. The condition is found in boys, not girls. Why is it not expected in girls?

Step 1. Use the symbol D for normal and d for Duchenne's muscular dystrophy. A girl with the disease would be X^dX^d. Creat a punnett square like the one below.

Step 3.

	$X-$	Y
$X-$		
$X-$	X^dX^d.	

For a girl to inherit the disease, she must receive one allele from her mother (genotype X^DX^d and one from her father (genotype X^dY). But because the boys die as early teens, there's little chance that they could ever be fathers….so girls inheriting the disease is not possible.

Problem Set 4: Dihybrid crosses: SOLUTIONS

1. *In peas, round seeds (R) dominates over wrinkled seeds (r). Yellow seed color (Y) dominates over green (y).*What is the genotype of an organism that is homozygous round and heterozygous yellow? What gametes could this organism form?

Parents geneotype: RRYy

Possible gametes: RY and Ry

2. Same set-up as problem # 1: What is the genotype of an organism that is heterozygous round and homozygous green? What gametes could it form?

Parents geneotype: Rryy

Possible gametes: Ry and ry

3. Refer again to problem # 1: What is the genotype of an organism whose genotype is homozygous wrinkled and homozygous yellow? What would be the possible genotypes of its gametes?

Parents geneotype: rrYY

Possible gametes: rY

4. Refer again to problem # 1: Cross a homozygous round, heterozygous yellow plant with one that is heterozygous round and homozygous green. What are the phenotypes of the offspring?

1) Parents genotypes: RRYy x Rryy

2) Gametes of parent 1 are RY and Ry; Gametes of parent 2 are Ry and ry

3) Note that since each parent can make two types of gametes, you only need a 2X2 punnett square:

	RY	Ry
Ry	RRYy	RRyy
ry	RrYy	Rryy

4) 2 round and yellow seed offspring: 2 are round and green seed offspring.

5. In watermelon, green (G) is dominant to striped (g). Short (S) is dominant to long (s). What is the genotype of an organism that is heterozygous green and heterozygous short? What gametes can it form?

Parents geneotype: GgSs

Possible gametes: GS, Gs, gS, gs

6. Refer to the problem above: cross two individuals who are both heterozygous green and short. What are the phenotypes of the offspring?

1) GgSs x GgSs

2) Gametes are
GS, Gs, gS, gs and GS, Gs, gS, gs

3) Punnett square has to be four by four:

	GS	Gs	gS	gs
GS	GGSS	GGSs	GgSS	GgSs
Gs	GGSs	GGss	GgSs	Ggss
gS	GgSS	GgSs	ggSS	ggSs
gs	GgSs	Ggss	ggSs	ggss

4) Analyze and show phenotypes
9 Green and Short: 3 Green and long: 3 striped and short: 1 striped and long

7. In humans, the gene for normal skin color (A) dominates the gene for albino skin (a). The gene for normal body height (M) dominates the gene for being a dwarf (m). Cross one parent that is heterozygous normal skin and heterozygous normal height with a heterozygous normal skin dwarf. What are the resulting phenotypes in the offspring?

1) Parental genotypes:
AaMm x Aamm

2) Gametes (use foil)
AM, Am, aM, am Am and am

3) One parent can make four types of gametes: the other only two. Make a Punnett square big enough to account for these possibilities: 4 x 2

	AM	Am	aM	am
Am	AAMm	AAmm	AaMm	Aamm
am	AaMm	Aamm	aaMm	aamm

4) Phenotypes
Normal skin, Normal Height: 3
Normal Skin midget: 3
Albino, normal height: 1
Albino midget: 1

8. Refer to the problem above. Cross a homozygous normal skinned dwarf with an albino dwarf. What are the resulting phenotypes?

1) Parental genotypes
AAmm x aamm

2) Gametes
Am x am

3) Each parent can make only one type of gamete. Your Punnett square can be 1 x 1

	Am
am	Aamm

4) All offspring are Normal skin midgets